US009785109B2

(12) **United States Patent**
Ohata

(10) **Patent No.: US 9,785,109 B2**
(45) **Date of Patent: Oct. 10, 2017**

(54) IMAGE FORMING APPARATUS

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/237,032**

(22) Filed: **Aug. 15, 2016**

(65) **Prior Publication Data**

US 2017/0060079 A1 Mar. 2, 2017

(30) **Foreign Application Priority Data**

Aug. 28, 2015 (JP) 2015-169571

(51) **Int. Cl.**

G03G 15/00	(2006.01)
G03G 21/16	(2006.01)
G03G 15/08	(2006.01)
G03G 15/23	(2006.01)

(52) **U.S. Cl.**

CPC ***G03G 21/1647*** (2013.01); ***G03G 21/1652*** (2013.01); *G03G 15/0879* (2013.01); *G03G 15/234* (2013.01); *G03G 2215/0132* (2013.01)

(58) **Field of Classification Search**

CPC G03G 21/1647; G03G 21/1652; G03G 15/0879; G03G 15/234; G03G 2215/0132
USPC 399/121, 124
See application file for complete search history.

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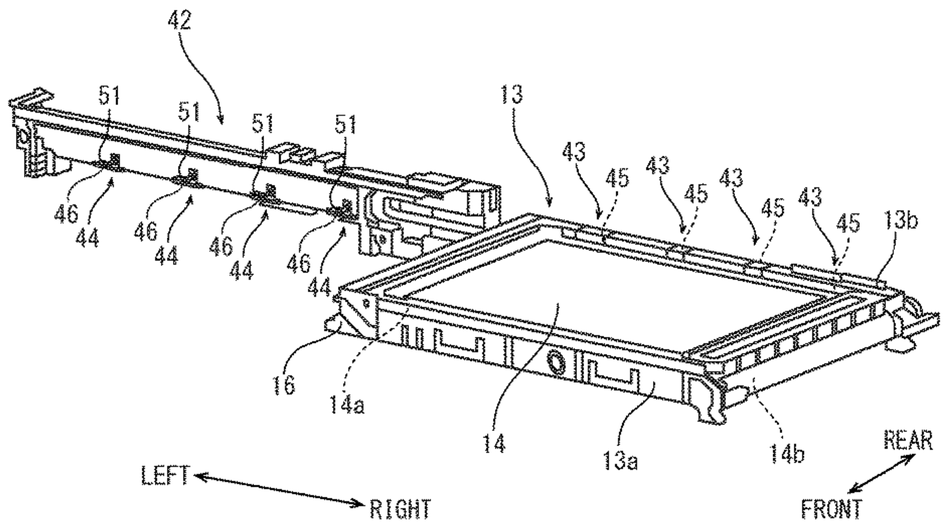
(57) **ABSTRACT**

An image forming apparatus includes a fixed contact point and a movable contact point. The fixed contact point is provided in a unit side opposing part. A movable contact point is provided in a rail side opposing part. The rail side opposing part is formed with an opening. The movable contact point is a contact spring formed of an electrical conductive wire. The movable contact point has a fixing part, a contact part and a pull-out prevention part. The fixing part is fixed to the rail on an opposite side to the rail side opposing part. The contact part is biased with respect to the fixing part to protrude toward the fixed contact point through the opening. The pull-out prevention part restricts a protruding position of the contact part toward the fixed contact point. The pull-out prevention part is formed into a spiral shape.

8 Claims, 8 Drawing Sheets



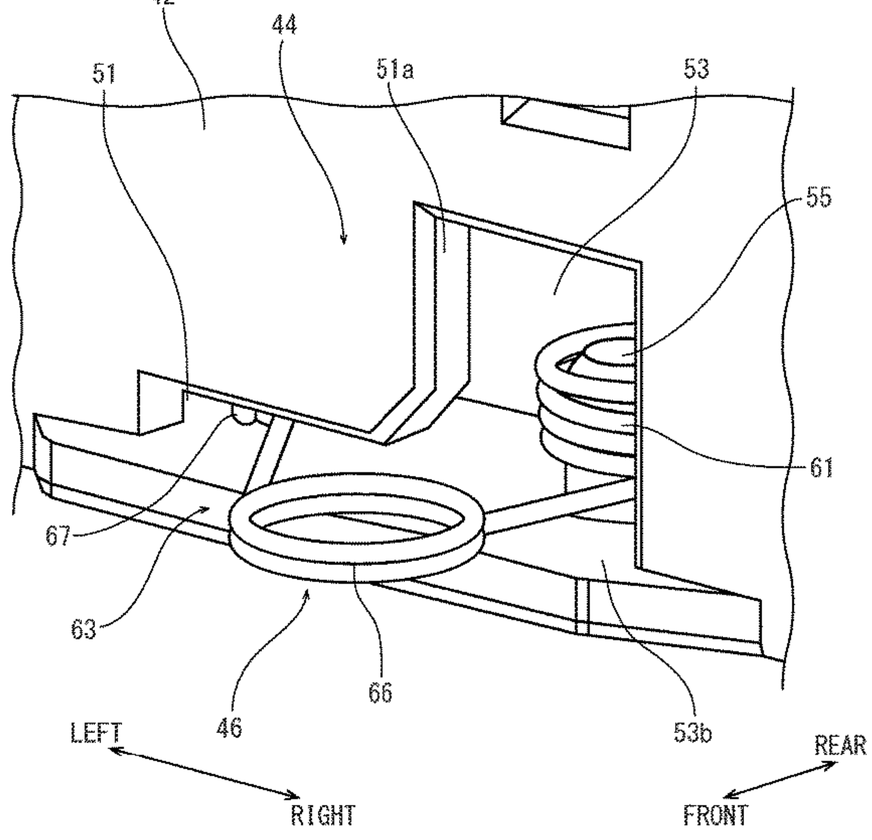
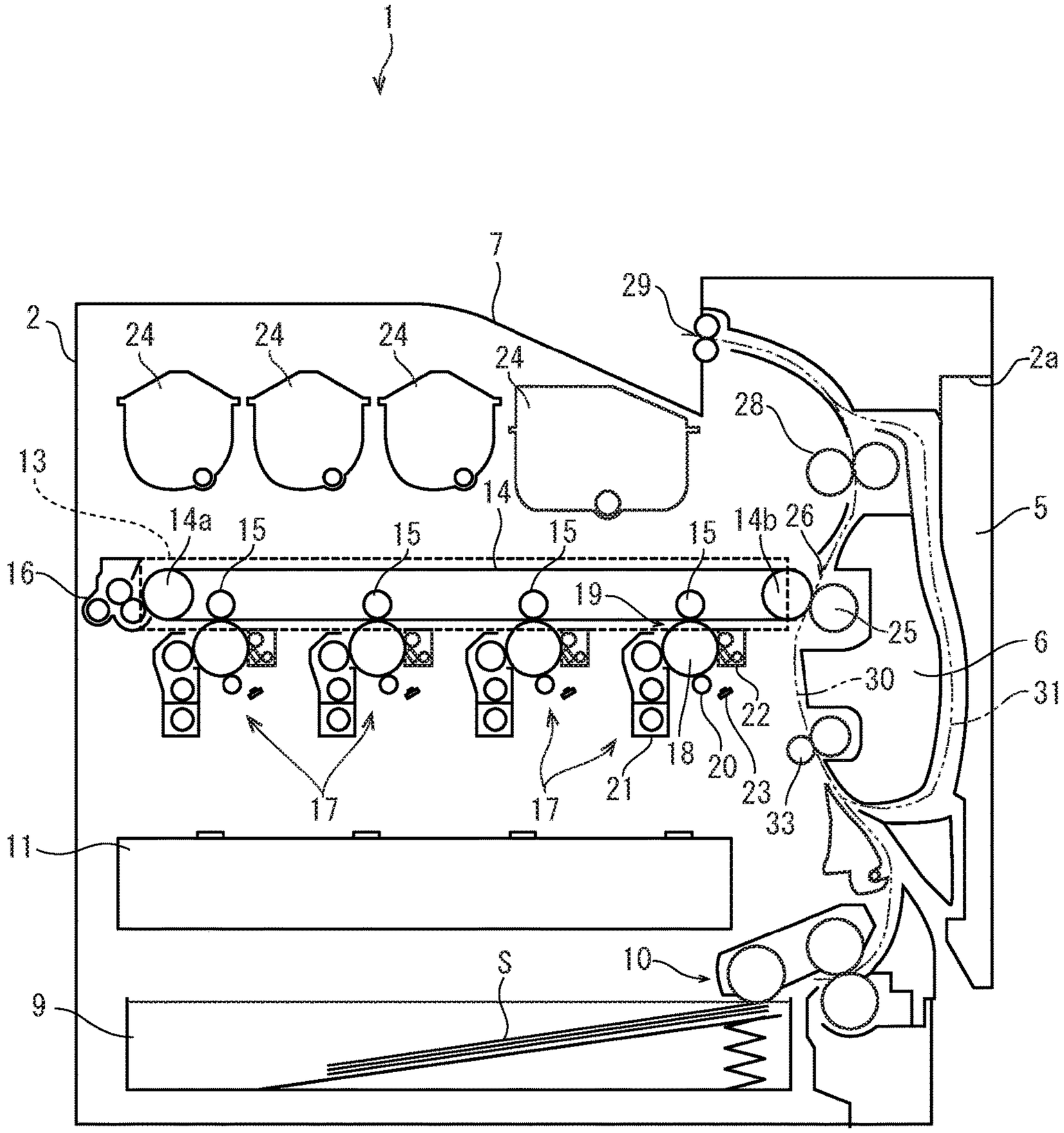


FIG. 1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29
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2a
24
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28
13
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5
14a
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15
15
15
14b
26
16
19
25
6
30
31
22
18
20
23
21
17
17
33
11
10
S
9
LEFT
RIGHT

FIG. 2

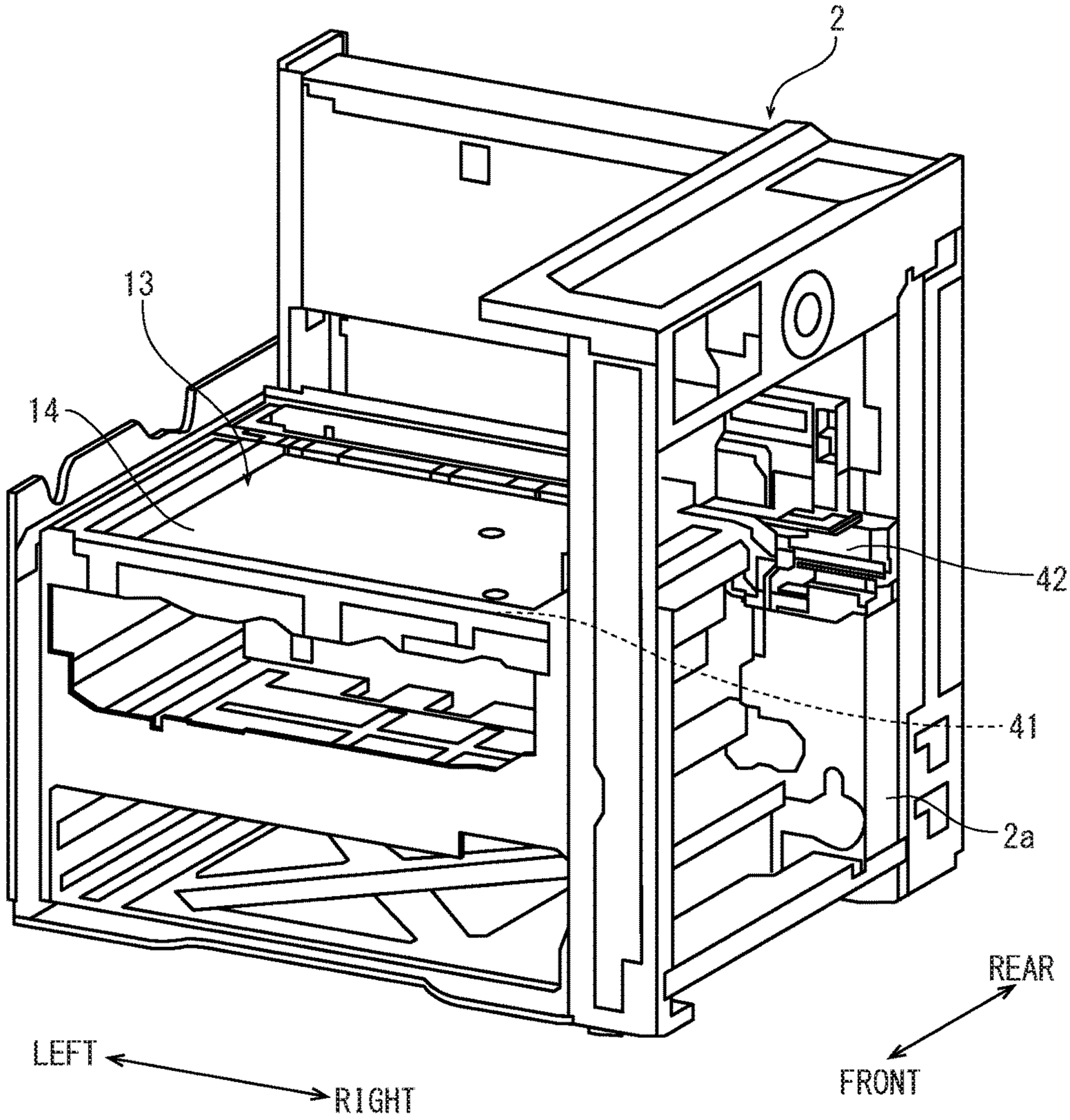
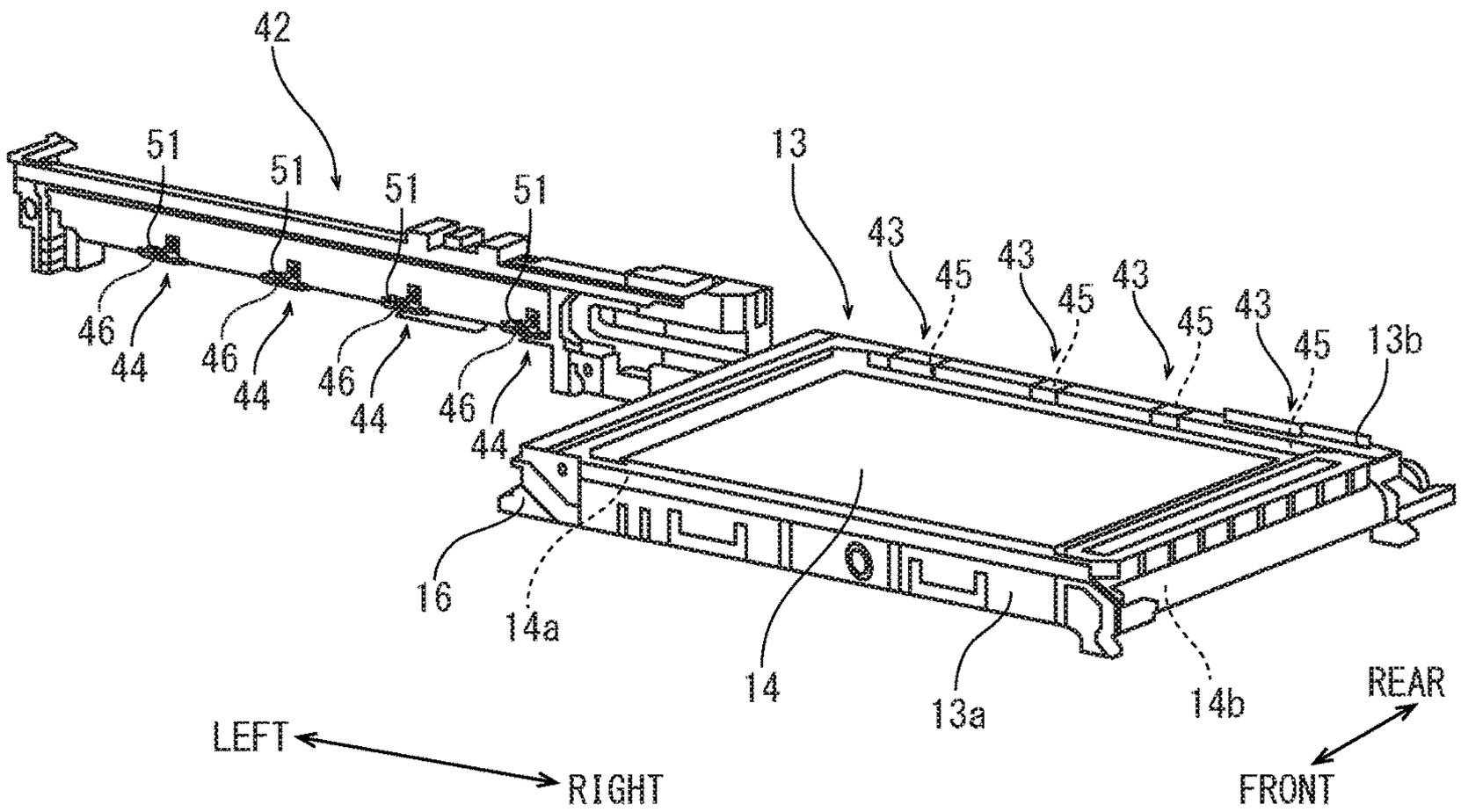


FIG. 3


42
51
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13
43
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43
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43
45
13b
46
44
46
44
46
44
46
44
16
14a
14
13a
14b
REAR
LEFT
RIGHT
FRONT

FIG. 4

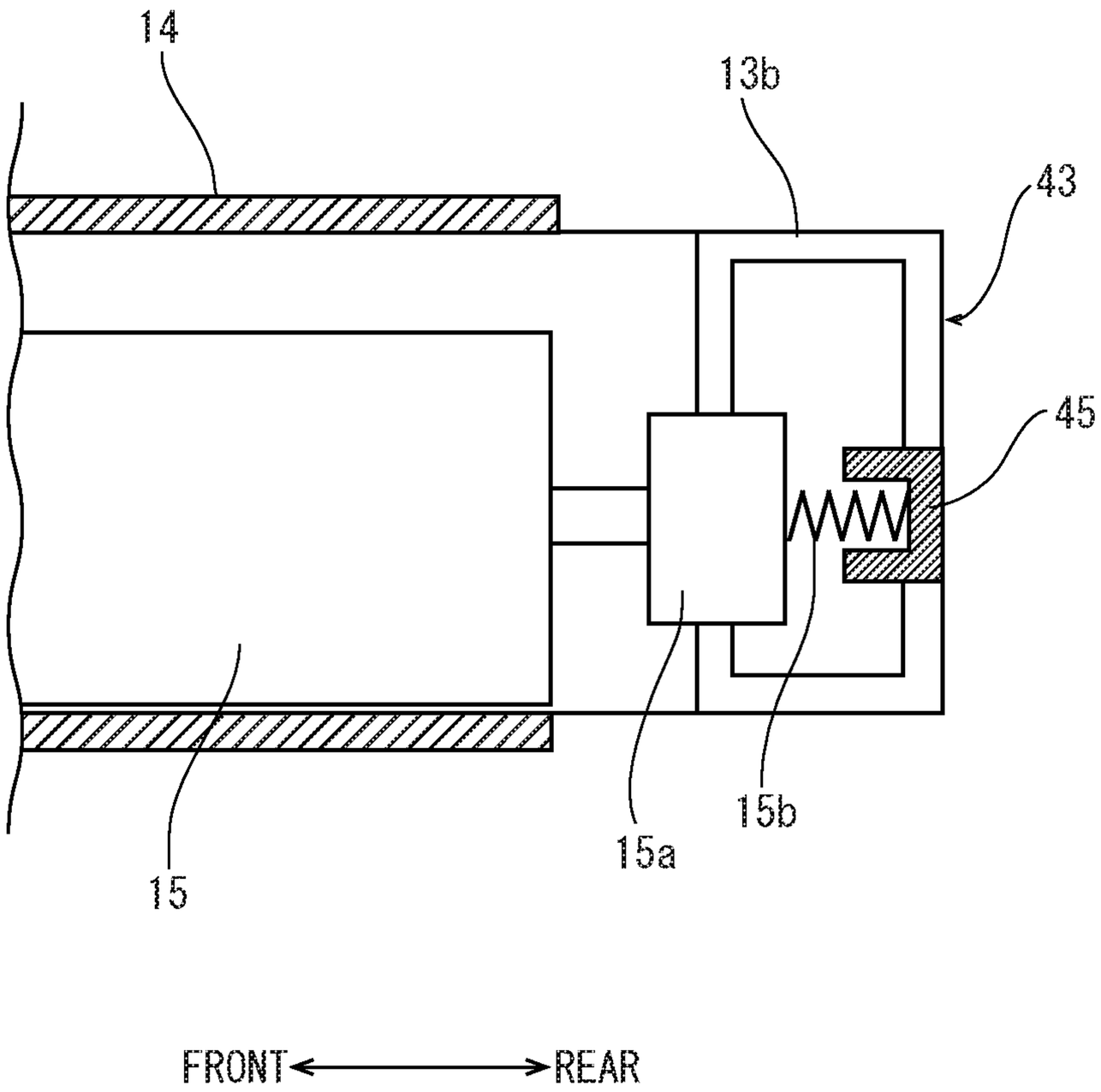

FIG. 5

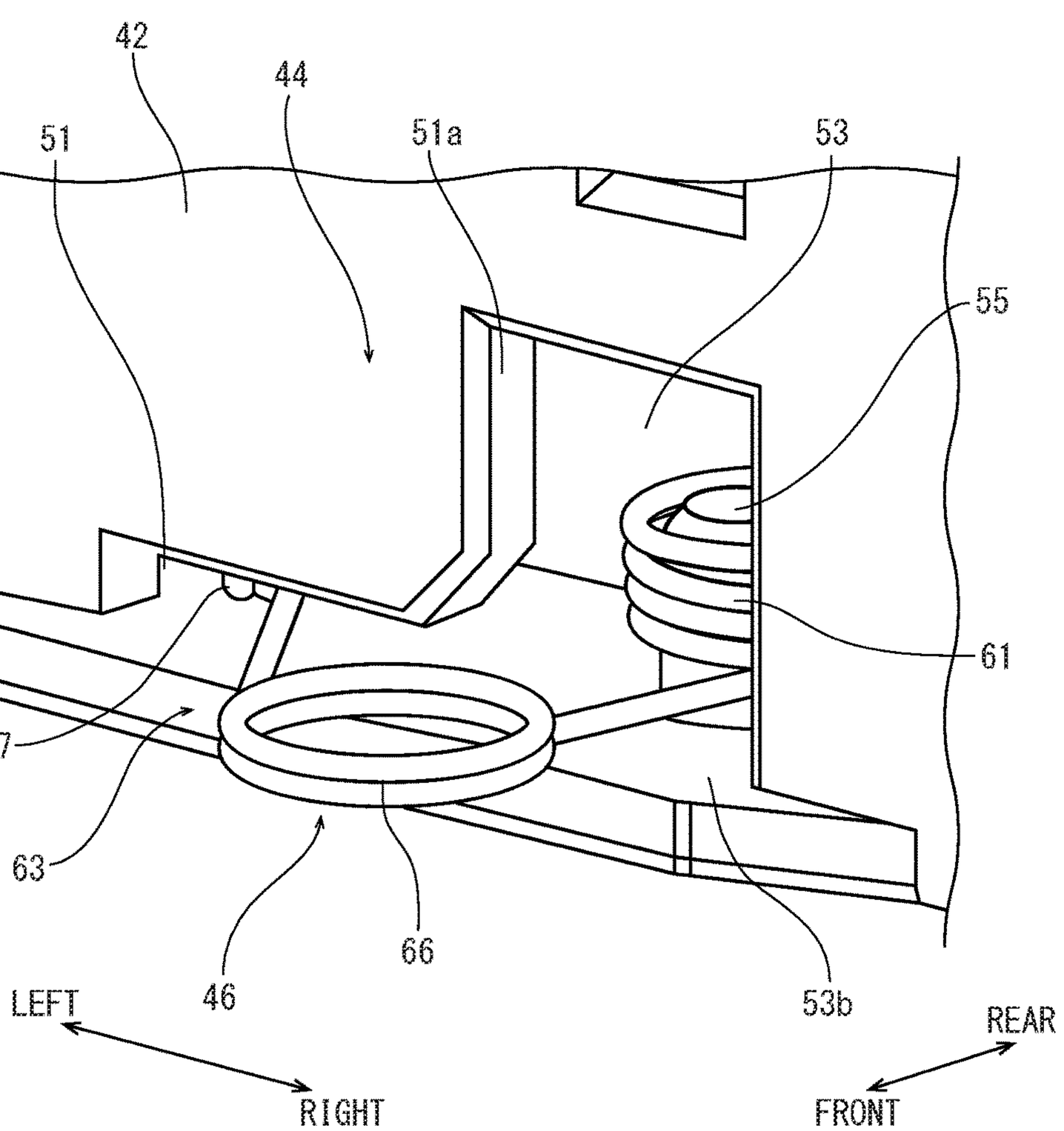

FIG. 6

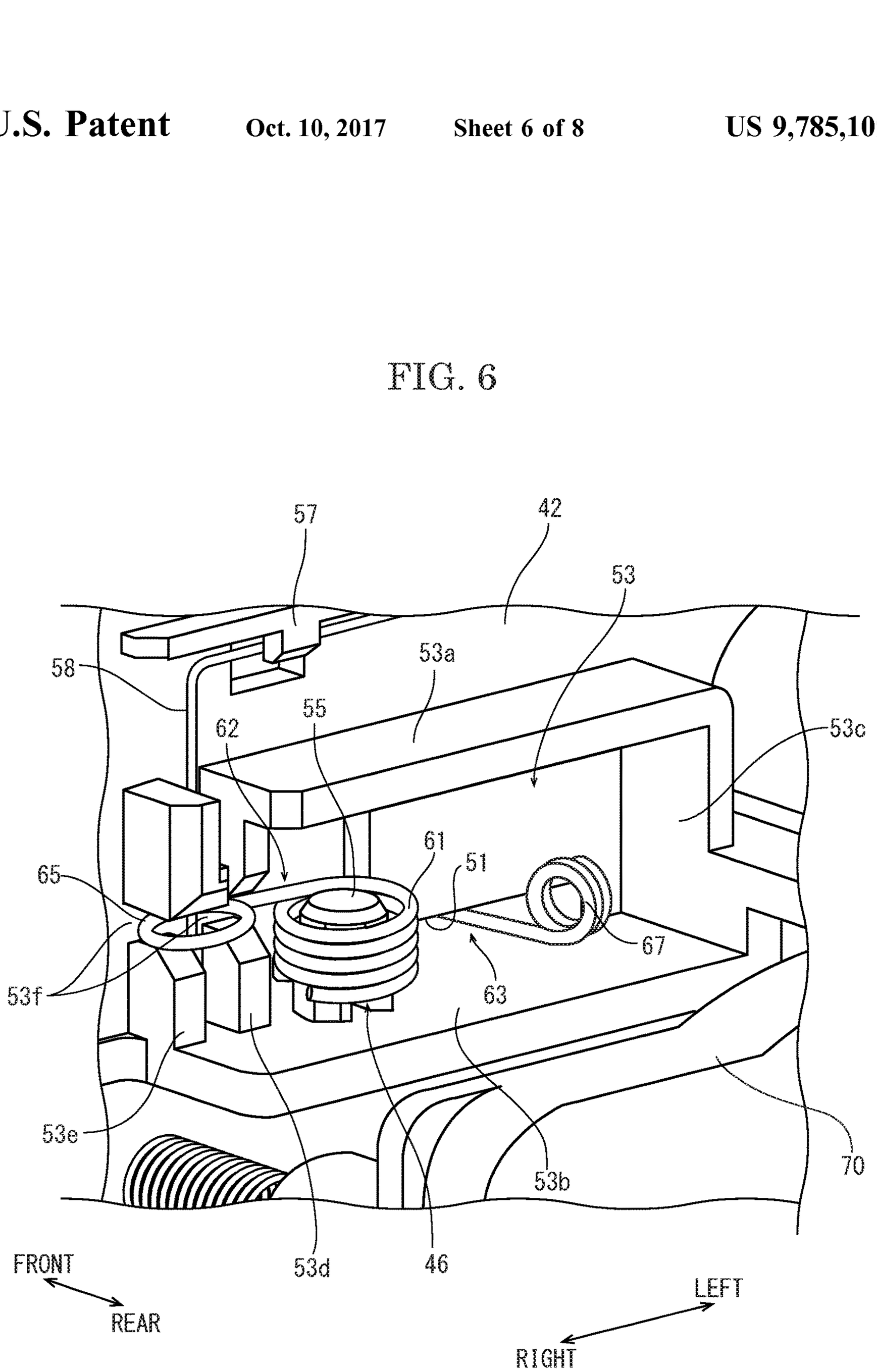
57
42
53
58
53a
55
62
53c
61
51
65
67
53f
63
53e
53b
70
53d
46
FRONT
REAR
LEFT
RIGHT

FIG. 7

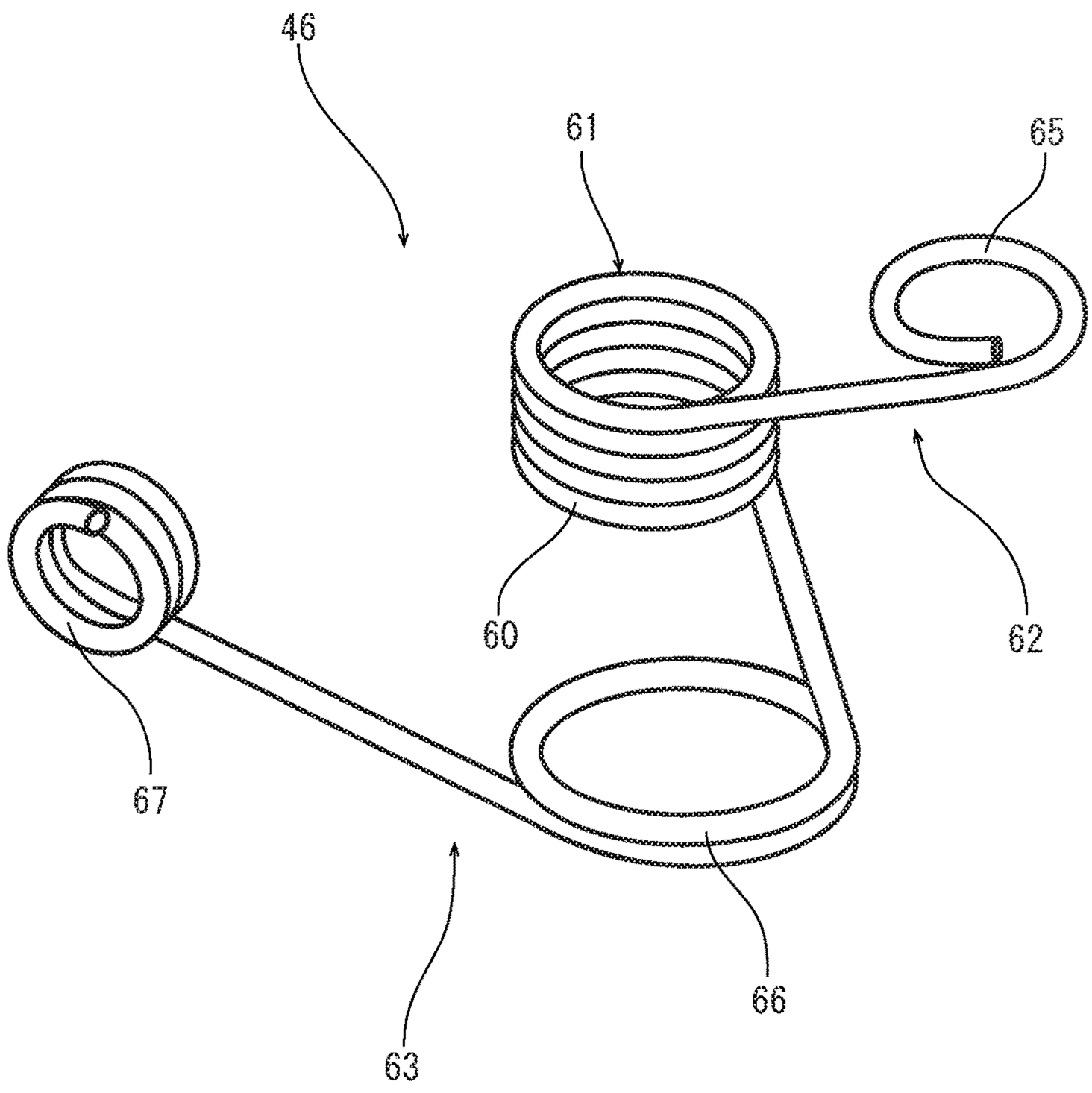

FIG. 8

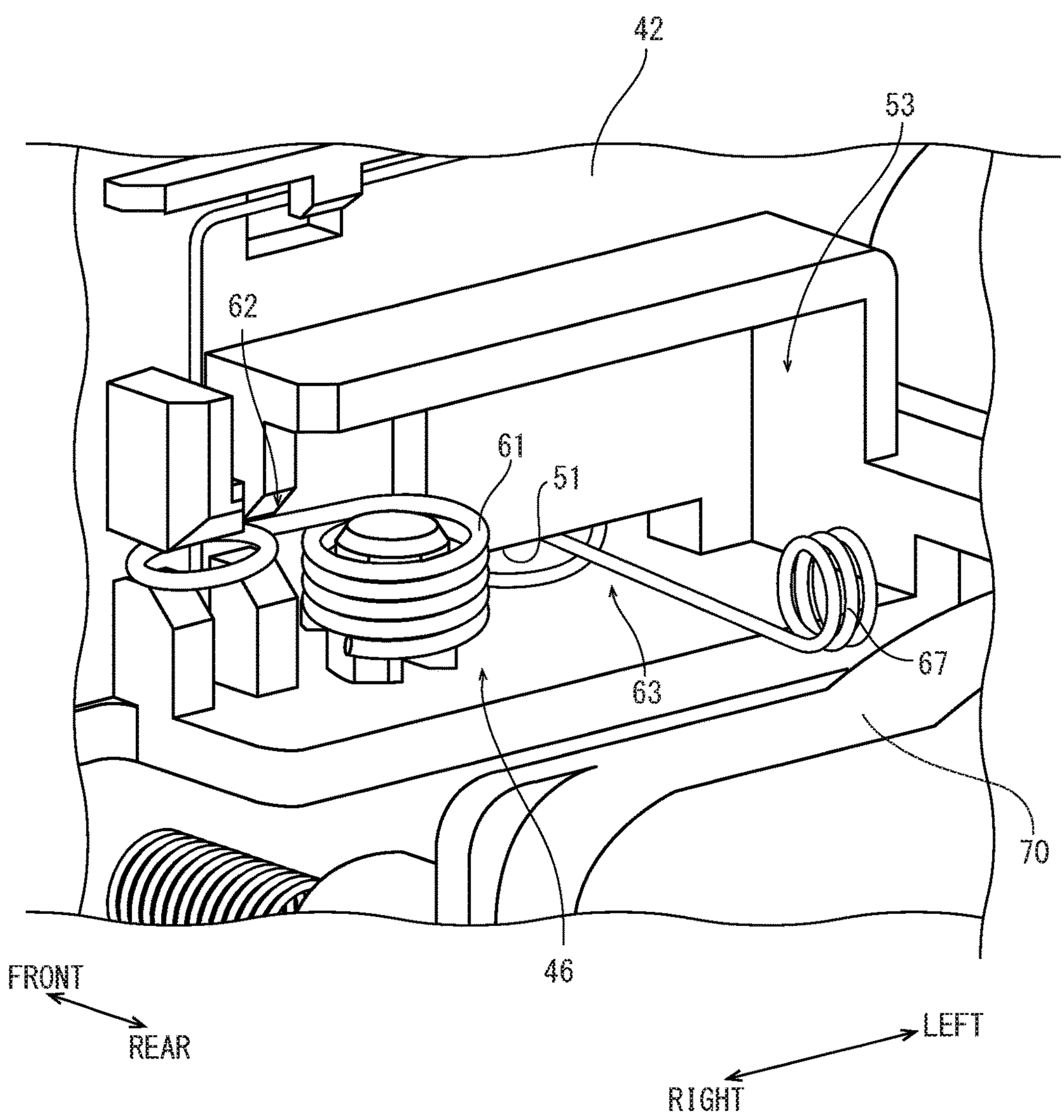

IMAGE FORMING APPARATUS

INCORPORATION BY REFERENCE

This application is based on and claims the benefit of priority from Japanese Patent application No. 2015-169571 filed on Aug. 28, 2015, the entire contents of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates to an image forming apparatus including an attachable/detachable intermediate transferring unit.

A full color image forming apparatus of recent years generally has a tandem-type configuration. In the tandem-type configuration, an image forming part provided for each toner color is disposed along a traveling direction of an endless intermediate transferring belt. In each image forming part, a single-color toner image is sequentially first-transferred onto the intermediate transferring belt to form a full-color toner image, and the full-color toner image is second-transferred onto a sheet. When the single-color toner image is transferred from each image forming part onto the intermediate transferring belt, a high voltage transferring bias is applied from a transferring bias power source to a first transferring roller which is disposed inside of a hollow space of the intermediate transferring belt so as to oppose to each image forming part.

The intermediate transferring belt and the first transferring rollers are united into an intermediate transferring unit. For the purpose of replacement or maintenance of the intermediate transferring belt or the first transferring roller, the intermediate transferring unit is configured to slide along a rail provided in an apparatus main body so as to be attachable to or detachable from the apparatus main body. The intermediate transferring unit is provided with a fixed contact point electrically connecting to the first transferring roller. On the other hand, the rail is provided with a movable contact point electrically connecting to the transferring bias power source. When the intermediate transferring unit is slid along the rail to be attached to the apparatus main body, the fixed contact point and the movable contact point are electrically connected to each other and a transferring bias is applied from the transferring bias power source to the first transferring roller.

In a case where the fixed contact point is provided in the intermediate transferring unit and the movable contact point is provided in the rail as described above, when the intermediate transferring unit is slid along the rail, there may be a case in which the movable contact point is hooked by the intermediate transferring unit or a frictional force between the movable contact point and the fixed contact point is too strong. In such a case, the movable contact point may be spaced away from the rail or the position of the movable contact point may be changed and then a contact failure between the movable contact point and the fixed contact point may occur.

In addition, there may be a case in which a plate-shaped movable contact point is provided in the intermediate transferring unit and the fixed contact point is provided in the rail. The movable contact point and the fixed contact point are disposed to oppose to each other in a vertical direction. One end portion of the movable contact point is fixed to the intermediate transferring unit and the other end portion is folded to form an engaging claw. Then, by engaging the engaging claw with an anti-folding member formed in the rail, the buckling of the engaging claw is prevented.

SUMMARY

In accordance with an embodiment of the present disclosure, an image forming apparatus includes a unit, a unit side opposing part, a rail side opposing part, a fixed contact point and a movable contact point. The unit is supported to be slidable along a rail between a position to be housed in an apparatus main body and a position to be pulled out from the apparatus main body. The unit side opposing part and a rail side opposing part are respectively provided on the unit and the rail so as to oppose to each other when the unit is slid along the rail into the position to be housed in the apparatus main body. The fixed contact point is provided in the unit side opposing part of the unit. The movable contact point is provided in the rail side opposing part of the rail and brings into pressure contact with the fixed contact point so as to be electrically connected to the fixed contact point. The rail side opposing part of the rail is formed with an opening. The movable contact point is a contact spring formed of an electrical conductive wire. The movable contact point has a fixing part, a contact part and a pull-out prevention part. The fixing part is fixed to the rail on an opposite side to the rail side opposing part. The contact part is biased with respect to the fixing part to protrude toward the fixed contact point through the opening. The pull-out prevention part is configured to restrict a protruding position of the contact part toward the fixed contact point. The pull-out prevention part is formed into a spiral shape.

The above and other objects, features, and advantages of the present disclosure will become more apparent from the following description when taken in conjunction with the accompanying drawings in which a preferred embodiment of the present disclosure is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view schematically showing an internal structure of a color printer according to an embodiment of the present disclosure.

FIG. **2** is a perspective view showing an intermediate transferring unit supported on front and rear rails which are provided in an apparatus main body, in the color printer according to the embodiment of the present disclosure.

FIG. **3** is a perspective view showing the intermediate transferring unit and the rear rail, in the color printer according to the embodiment of the present disclosure.

FIG. **4** is a sectional view showing a fixed contact point provided in the intermediate transferring unit, in the color printer according to the embodiment of the present disclosure.

FIG. **5** is a perspective view showing a movable contact point supported on the rear rail, viewed from a front side, in the color printer according to the embodiment of the present disclosure.

FIG. **6** is a perspective view showing the movable contact point supported on the rear rail, viewed from a rear side, in the color printer according to the embodiment of the present disclosure.

FIG. **7** is a perspective view showing the movable contact point, in the color printer according to the embodiment of the present disclosure.

FIG. **8** is a perspective view showing the movable contact point coming into pressure contact with the fixed contact

point, viewed from the rear side, in the color printer according to the embodiment of the present disclosure.

DETAILED DESCRIPTION

Hereinafter, with reference to figures, an image forming apparatus according to an embodiment of the present disclosure will be described.

First, with reference to FIG. **1**, an entire structure of a color printer **1** as an image forming apparatus will be described. FIG. **1** is a perspective view schematically showing the color printer **1**. In the following description, a front side of FIG. **1** shows a front side of the color printer, and left and right directions are based on a direction viewed the color printer **1** from the front side.

The color printer **1** is provided with an apparatus main body **2** of a rectangular parallelepiped shape as shown in FIG. **1**. On a right side face of the apparatus main body **2**, an opening **2***a* is formed. The opening **2***a* is opened and closed by a both-face conveying unit **5** which is supported turnably around its lower end. Inside of the both-face conveying unit **5**, an intermediate conveying unit **6** is supported turnably around its lower end. On an upper face of an upper cover which covers an upper face of the apparatus main body **2***a*, an ejected sheet tray **7** on which a sheet is ejected is formed.

In a lower part of the apparatus main body **2**, a sheet feeding cassette **9** which stores sheets S is attachably and detachably installed. On the right side of the sheet feeding cassette **9**, a sheet feeding device **10** which feeds the sheet S from the sheet feeding cassette **9** is provided. Above the sheet feeding cassette **9**, an exposure device **11** containing a laser scanning unit (LSU) is provided. Above the exposure device **11**, an intermediate transferring unit **13** is supported so as to be slide through the opening **2***a* between a position to be stored in the apparatus main body **2** and another position to be pulled out the apparatus main body **2**. The intermediate transferring unit **13** is provided with an endless intermediate transferring belt **14**, four first transferring rollers **15** and a cleaning device **16**. The intermediate transferring belt **14** is supported turnably around a driven roller **14***a* and a driving roller **14***b* which are disposed at a predetermined interval in the left and right direction. The first transferring rollers **15** are disposed aligning in the left and right directions in a lower space of a hollow space of the intermediate transferring belt **14**. The cleaning device **16** is disposed outside of the left end of the intermediate transferring belt **14**. The intermediate transferring unit **13** will be described later. Under each of the first transferring rollers **15**, an image forming part **17** is provided.

In the image forming part **17**, a photosensitive drum **18** is rotatably supported opposite to the first transferring roller **15**. Between the photosensitive drum **18** and the intermediate transferring belt **14**, a first transferring part **19** is formed. Around the photosensitive drum **18**, a charger **20**, a development device **21**, a cleaning device **22** and a static eliminator **23** are disposed in sequential order along a rotation direction of the photosensitive drum **18**. Above the intermediate transferring unit **13**, toner containers **24** for every four color (Y, M, C and K) are installed corresponding to the image forming parts **17**.

On the right side of the intermediate transferring unit **13**, a second transferring roller **25** is rotatably supported to the intermediate conveying unit **6**. Between the intermediate transferring belt **14** and the second transferring roller **25**, a second transferring part **26** is formed. Above the second transferring part **26**, a fixing device **28** is disposed. Above the fixing device **28**, a sheet ejecting part **29** facing the ejected sheet tray **7** is provided.

In the apparatus main body **2**, a main sheet conveying path **30** and a duplex printing path **31** are formed. The main sheet conveying path **30** extends from the sheet feeding device **10** to the sheet ejecting part **29** through the second transferring part **26** and the fixing device **28**. The duplex printing path **31** is branched rightward from the main sheet conveying path **30** on a downstream side of the fixing device **28** and formed in an approximately C-shape. On the main sheet conveying path **30**, a resist roller pair **33** is disposed on an upstream side from the second transferring part **26**.

Next, the operation of forming an image by the color printer **1** having such a configuration will be described. In each image forming part **17**, after a surface of the photosensitive drum **18** is charged by the charger **20**, the exposure device **11** exposes the surface of the photosensitive drum **18** with a laser light based on an image date to form an electrostatic latent image on the surface of the photosensitive drum **18**. The electrostatic latent image is then developed into a toner image of corresponding color toner by the developing device **21**. The toner image formed on the photosensitive drum **18** is first transferred on a surface of the intermediate transferring belt **14** at the first transferring part **19** by the first transferring roller **15** which is charged with a transferring bias of the same polarity as the toner. The above operation is performed at each image forming part **17** to form a full color toner image on the intermediate transferring belt **14**. The toner and charge remained on the photosensitive drum **18** are removed by the cleaning device **22** and the static eliminator **23**, respectively.

On the other hand, the sheet fed from the sheet feeding cassette **9** by the sheet feeding device **10** is conveyed along the main sheet conveying path **30** into the second transferring part **26** in a suitable timing with the above image forming operation. At the second transferring part **26**, the full color toner image on the intermediate transferring belt **14** is transferred on the sheet. The sheet on which the toner image is transferred is conveyed on a downstream side along the main sheet conveying path **30** and enters the fixing device **28** and then, the toner image is fixed on the sheet in the fixing device **28**. The sheet with the fixed toner image is ejected from the sheet ejecting part **29** on the ejected sheet tray **7**. When a duplex printing is performed, the sheet in which an image is formed on one face is conveyed through the duplex printing path **31** into the main sheet conveying path **30** to form an image on the other face of the sheet. The toner and paper dust remained on the intermediate transferring belt **14** are removed by the cleaning device **16**.

Next, with reference to FIG. **1** and FIG. **2** to FIG. **4**, the intermediate transferring unit **13** will be described. FIG. **2** is a perspective view showing the intermediate transferring unit housed in the apparatus main body; FIG. **3** is a perspective view showing the intermediate transferring unit and the front and rear rails; and FIG. **4** is a view schematically showing the fixed contact point.

As shown in FIG. **2**, the apparatus main body **2** is provided with a pair of front and rear rails **41**, **42** extending in the left and right directions. The front and rear rails **41**, **42** are arranged opposing to each other in the front and rear directions near a center in a vertical direction of the apparatus main body **2**. The intermediate transferring unit **13** is supported to be slidable along the pair of front and rear rails **41**, **42**. The intermediate transferring unit **13** is slid rightward to be pulled out through the opening **2***a* and is slid leftward to be housed in the apparatus main body **2**.

The intermediate transferring unit **13**, as shown in FIG. **3**, has horizontally elongated front and rear supporting plates **13***a*, **13***b* which are arranged opposing to each other in the front and rear directions. Between the front and rear supporting plates **13***a*, **13***b*, the driving roller **14***b* is rotatably supported at the right end and the driven roller **14***a* is rotatably supported at the left end. The intermediate transferring belt **14** is wound around the driving roller **14***b* and the driven roller **14***a*. When the driving roller **14***b* is driven to rotate, the intermediate transferring belt **14** circulates and travels. In addition, the cleaning device **16** is supported by the front and rear supporting plates **13***a*, **13***b* on the left side of the driven roller **14***a*. Four first transferring rollers **15**, as shown in FIG. **1**, are disposed at the lower space of the hollow space of the intermediate transferring belt **14** and are rotatably supported between the front and rear supporting plates **13***a*, **13***b*.

The rear supporting plate **13***b* of the intermediate transferring unit **13** and the rear rail **42** of the pair of the front and rear rails **41**, **42** are respectively provided with four unit side opposing parts **43** and four rail side opposing parts **44** which are arranged at intervals in the left and right directions. When the intermediate transferring unit **13** is housed in the apparatus main body **2**, the four unit side opposing parts **43** and the four rail side opposing parts **44** oppose to each other in the front and rear directions. In addition, when the intermediate transferring unit **13** is housed in the apparatus main body **2**, each unit side opposing part **43** and each rail side opposing part **44** are positioned corresponding to each first transferring roller **15**.

The unit side opposing part **43** formed in the intermediate transferring unit **13** is formed with a fixed contact point **45**. The rail side opposing part **44** formed in the rear rail **42** supports a movable contact point **46**. When the intermediate transferring unit **13** is housed in the apparatus main body **2**, the fixed contact point **45** and the movable contact point **46** are electrically connected to each other, and a transferring bias is applied from the transferring bias power source provided in the apparatus main body **2** to each first transferring roller **15**.

The fixed contact point **45** will be described with reference to FIG. **4**. The fixed contact point **45** is a U-shaped member in a side view, made of an electrically conductive material (for example, an SUS plate). The fixed contact point **45** is fixed to each unit side opposing part **43** of the rear supporting plate **13***b* of the intermediate transferring unit **13** with its rear face exposed rearward. A rear end portion of a rotating shaft of each first transferring roller **15** is rotatably supported on the rear supporting plate **13***b* with an electrically conductive bearing **15***a*. The electrically conductive bearing **15***a* and the fixed contact point **45** are electrically connected to each other by an electrically conductive spring member **15***b*. In this manner, the fixed contact point **45** and the first transferring roller **15** are electrically connected to each other through the spring member **15***b* and the electrically conductive bearing **15***a*.

Next, with reference to FIG. **3** and FIG. **5** to FIG. **6**, the movable contact point **46** will be described. FIG. **5** is a perspective view showing the movable contact point supported in a housing recessed part formed in the rear rail, viewed from the front side; and FIG. **6** is a perspective view showing the movable contact point supported in the housing recessed part formed in the rear rail, viewed from the rear side.

Each rail side opposing part **44** of the rear rail **42**, as shown in FIG. **3**, is formed with an opening **51**. As shown in FIG. **5**, the opening **51** has a horizontally elongated shape along a length direction of the rear rail **42**. In addition, the rear rail **42** is formed with a rectangular window **51***a* communicating with a right end portion of an upper edge of each opening **51**.

On a rear face of each rail side opposing part **44**, as shown in FIG. **6**, a housing recessed part **53** around the opening **51** is formed. The housing recessed part **53** is surrounded by top and bottom walls **53***a*, **53***b* and left and right walls **53***c*, **53***d*. A rear side face of the housing recessed part **53** is opened. As shown in FIG. **5**, the bottom wall **53***b* is horizontally formed and protrudes slightly forward from the rear rail **42**. Each corner of the protruded bottom wall **53***b* is formed in a tapered shape.

As shown in FIG. **6**, on a right end portion of a top face of the bottom wall **53***b*, a boss **55** is erected. Further, on the bottom wall **53***b*, an outside wall **53***e* is formed at a predetermined interval outside of the right wall **53***d*. On each rear edge of the right wall **53***d* and the outside wall **53***e*, a triangular notch **53***f* in a side view is formed near a center in the vertical direction.

Further, on the rear face of each rail side opposing part **44**, a hook **57** is formed above the housing recessed part **53**. By the hook **57**, a power line **58** to be connected to the transferring bias power source is supported. The power line **58** bends downward at each housing recessed part **53** and a tip end portion thereof is supported between the right wall **53***d* and the outside wall **53***e*.

Next, with reference to FIG. **7**, the movable contact point **46** will be described. FIG. **7** is a perspective view showing the movable contact point.

The movable contact point **46** is a contact spring formed by winding an electrically conductive spring wire **60** into a coil spring shape. The movable contact point **46** has a winding part **61**, a first extension part **62** and a second extension part **63**. The winding part **61** is formed by spirally winding a middle portion of the wire **60** around the vertical axis. The first extension part **62** is formed of the wire **60** extending from an upper end of the winding part **61**. The second extension part **63** is formed of the wire **60** extending from a lower end of the winding part **61**.

At a tip end of the first extension part **62**, an electrically conductive part **65** is formed by spirally winding one end portion of the wire **60** by one turn around the vertical axis.

At a middle portion of the second extension part **63**, a contact part **66** is formed. At a tip end portion of the second extension part **63**, a pull-out prevention part **67** is formed. The contact part **66** is formed by spirally winding the wire **60** by one and half turns around the vertical axis. In this manner, the second extension part **63** bends at an acute angle around the contact part **66**. The pull-out prevention part **67** is formed by starting winding the other end portion of the wire **60** upward around the horizontal axis and then spirally winding it by two and half turns around the horizontal axis. The pull-out prevention part **67** is formed at a higher level than the contact part **66**.

The movable contact point **46**, as shown in FIG. **5** and FIG. **6**, is supported in the housing recessed part **53** of the rear rail **42**. The winding part **61** and the first extension part **62** of the movable contact point **46** form a fixing part to be fixed to the rear rail **42**. The winding part **61** is fitted to the boss **55**. The first extension part **62** is pinched between notches **53***f* formed in the right wall **53***d* and the outside wall **53***e*. In this manner, the movable contact point **46** is fixed to the rear rail **42** on an opposite side to the rail side opposing part **44**. The electrically conductive part **65** is positioned in a gap between the right wall **53***d* and the outside wall **53***e* and is electrically connected to the power line **58** connecting

to the transferring bias power source. The second extension part **63** is supported on the top face of the bottom wall **53***b* and is biased with respect to the first extension part **62** so that the contact part **66** protrudes forward from the bottom wall **53***b* through the opening **51** (refer to FIG. **5**). In addition, the pull-out prevention part **67** is engagingly locked with an upper edge of the opening **51** so that the protruding position of the contact part **66** from the opening **51** is restricted (refer to FIG. **6**).

In the color printer **1** having the above construction, if the intermediate transferring unit **13** is slid along the pair of front and rear rails **41**, **42** and then is housed in the apparatus main body **2**, the contact part **66** of the movable contact point **46** supported on the rear rail **42** is pressed rearward by the rear face of the rear supporting plate **13***b* of the intermediate transferring unit **13**. In this manner, the second extension part **63** turns on the top face of the bottom wall **53***b* in the clockwise direction of FIG. **5** and FIG. **6** with respect to the boss **55**. If the intermediate transferring unit **13** is housed in the apparatus main body **2**, each unit side opposing part **43** of the rear supporting plate **13***b* of the intermediate transferring unit **13** and each rail side opposing part **44** of the rear rail **42** oppose to each other. Then, the second extension part **63** of the movable contact point **46** is biased in the counterclockwise direction of FIG. **5** and FIG. **6** around the winding part **61** and then the contact part **66** is brought into pressure contact with the fixed contact point **45**. Thus, the fixed contact point **45** and the movable contact point **46** are electrically connected to each other, and it becomes possible to apply a transferring bias from the transferring bias power source to each first transferring roller **15**. In addition, if the contact part **66** is pressed rearward, as shown in FIG. **8**, the pull-out prevention part **67** is spaced rearward from the bottom wall **53***b* of the housing recessed part **53**.

On the other hand, if the intermediate transferring unit **13** is pulled out from the apparatus main body **2** along the pair of front and rear rails **41**, **42**, the pressing of the contact part **66** of the movable contact point **46** with respect to the fixed contact point **45** is released. In this manner, the second extension part **63** is biased in the counterclockwise direction of FIG. **5** and FIG. **6** around the winding part **61** and then the contact part **66** protrudes forward through the opening **51**. However, because the pull-out prevention part **67** is engagingly locked with the upper edge of the opening **51**, the protruding position of the contact part **66** is restricted. Here, because the pull-out prevention part **67** is formed at the higher level than the contact part **66**, the pull-out prevention part **67** does not interfere with the bottom wall **53***b* of the housing recessed part **53** or parts **70** mounted under the rear rail **42** when it protrudes forward.

As has been described hereinabove, in the color printer **1** of the present disclosure, since the contact part **66** of the movable contact point **46** is engagingly locked with the upper edge of the opening **51** by the pull-out prevention part **67**, the protruding position of the contact part **66** through the housing recessed part **53** can be restricted. Since the pull-out prevention part **67** is formed by spirally winding one end portion of the wire **60**, it is hardly to be deformed. Therefore, in a case where the contact part **66** is hooked on the intermediate transferring unit **13** or the frictional force between the fixed contact point **45** and the contact part **66** is strong when the intermediate transferring unit **13** is pulled out, the pull-out prevention part **67** is engagingly locked with the upper edge of the opening **51** so that the protruding position of the contact part **66** through the housing recessed part **53** can be kept to be constant. As the result, the contact part **66** and the fixed contact point **45** can be reliably brought into contact with each other.

In a case where a force acting on the contact part **66** in the direction separating away from the housing recessed part **53** is strong, the pull-out prevention part **67** is deformed such that the winding of the pull-out prevention part **67** is released; and however, the remaining winding portion is engagingly locked with the upper edge of the opening **51**. Therefore, even if such a deformation occurs, the contact part **66** is prevented from being pulled out through the opening **51**.

Incidentally, in the case where the pull-out prevention part **67** is deformed such that the winding of the pull-out prevention part **67** is released, the protruding position of the contact part **66** slightly varies. However, when the intermediate transferring unit **13** is housed in the apparatus main body **2**, since the second extension part **63** that is a movable portion is biased with respect to the first extension part **62** fixed to the rear rail **42**, the positioning precision between the contact part **66** and the fixed contact point **45** does not significantly vary and the contact part **66** can be therefore reliably brought into contact with the fixed contact point **45**. Also, it is possible to prevent the contact part **66** and the pull-out prevention part **67** from being completely pulled out through the opening **51**.

In addition, the pull-out prevention part **67** is formed by starting winding the end portion of the wire **60** upward and then spirally winding the wire along the horizontal axis and is formed at the higher level than the contact part **66**. Accordingly, when the second extension part **63** is turned, the pull-out prevention part **67** moves the inside of the housing recessed part **53** and does not interfere with the bottom wall **53***b* of the housing recessed part **53** or the parts **70** or the like mounted under the housing recessed part **53**.

Further, since the contact part **66** is formed by spirally winding the wire **60** by one and half turns, an outer circumferential face of the wire **60** of the contact part **66** comes into point contact with the rear supporting plate **13***b* of the intermediate transferring unit **13**. Therefore, the frictional force between the movable contact point **46** and the rear supporting plate **13***b* is reduced so that the intermediate transferring unit **13** can be smoothly slid. Furthermore, since the contact part **66** is formed by winding the wire **60** in two turns and two outer circumferential faces of the wire **60** come into contact with the fixed contact point **45**, the contact part **66** can be constantly brought into contact with the fixed contact point **45**.

Although the present embodiment is described as to the case in which the pull-out prevention part **67** is formed by winding spirally along the horizontal axis, the pull-out prevention part **67** may be formed by winding along the vertical axis depending on the shape of the contact part **66** or the dimensions and position of the opening **51**. Also, although in the present embodiment, the pull-out prevention part **67** is formed at the higher level than the contact part **66**, the pull-out prevention part **67** may be formed at a lower level than the contact part **66** or formed so as to protrude upward or downward from the contact part **66** depending on the shape of the contact part **66** or the dimensions or position of the opening **51**.

In addition, although the present embodiment is described as to the intermediate transferring unit **13** as a unit supported to be slidable between a position to be housed in the apparatus main body **2** and a position to be pulled out from the apparatus main body **2**, the present disclosure can be applied to a unit requiring electrical connection to the

apparatus main body **2** and attached to or detached from the apparatus main body **2** by way of sliding movement.

While the preferable embodiment and its modified example of the sheet feeding device and the image forming apparatus of the present disclosure have been described above and various technically preferable configurations have been illustrated, a technical range of the disclosure is not to be restricted by the description and illustration of the embodiment. Further, the components in the embodiment of the disclosure may be suitably replaced with other components, or variously combined with the other components. The claims are not restricted by the description of the embodiment of the disclosure as mentioned above.

What is claimed is:

1. An image forming apparatus comprising:

a unit supported to be slidable along a rail between a position to be housed in an apparatus main body and a position to be pulled out from the apparatus main body;

a unit side opposing part and a rail side opposing part respectively provided on the unit and the rail so as to oppose to each other when the unit is slid along the rail into the position to be housed in the apparatus main body;

a fixed contact point provided in the unit side opposing part of the unit; and

a movable contact point provided in the rail side opposing part of the rail and brought into pressure contact with the fixed contact point so as to be electrically connected to the fixed contact point,

wherein the rail side opposing part of the rail is formed with an opening,

the movable contact point is a contact spring formed of an electrical conductive wire, and has:

a fixing part to be fixed to the rail on an opposite side to the rail side opposing part;

a contact part biased with respect to the fixing part to protrude toward the fixed contact point through the opening; and

a pull-out prevention part configured to restrict a protruding position of the contact part toward the fixed contact point, and

wherein the pull-out prevention part is formed into a spiral shape.

2. The image forming apparatus according to claim **1**,

wherein the movable contact point has:

a winding part formed by spirally winding a middle portion of the wire along a vertical axis;

a first extension part formed of the wire extending from an upper end of the winding part; and

a second extension part formed of the wire extending from a lower end of the winding part,

wherein the fixing part is formed by the winding part and the first extension part,

the contact part is formed at a middle portion of the second extension part and

the pull-out prevention part is formed at a tip end portion of the second extension part,

wherein the pull-out prevention part is formed by spirally winding the tip end portion of the second extension part along a horizontal axis.

3. The image forming apparatus according to claim **2**,

wherein the pull-out prevention part is formed at a higher level than the contact part.

4. The image forming apparatus according to claim **2**,

wherein the contact part is formed by spirally winding the wire along the vertical axis by at least one turn or more.

5. The image forming apparatus according to claim **2**,

wherein the contact part is positioned to be deeper from the fixing part in an attaching direction in which the unit is to be housed in the apparatus main body, and

the pull-out prevention part is positioned to be deeper from the contact part in the attaching direction of the unit.

6. The image forming apparatus according to claim **2**,

wherein the pull-out prevention part is engagingly locked with an upper edge of the opening.

7. The image forming apparatus according to claim **1**,

wherein the rail has a horizontal supporting portion configured to support the contact part and the pull-out prevention part.

8. The image forming apparatus according to claim **1**,

wherein the unit is an intermediate transferring unit having an endless intermediate transferring belt which is rotatably provided and a transferring roller which is disposed in a hollow space of the intermediate transferring belt,

the fixed contact point is electrically connected to the transferring roller,

the movable contact point is electrically connected to a transferring bias power source, and

by electrically connecting the fixed contact point and the movable contact point to each other, a transferring bias is applied from the transferring bias power source to the transferring roller, enabling a toner image to be transferred onto the intermediate transferring belt.

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